

6

Primary Science and Technology

4

The Solar System



Teachers' Guide

The Solar System

MODULE 1: K – 2

MODULE 2: 3– 4

MODULE 3: 5– 6

Preface

The development of learning outcomes for the core curriculum in OECS primary and lower secondary schools is an essential part of the harmonization of OECS educational systems. The curriculum harmonization process commenced seven years ago with discussions between the OECS Education Reform Unit (OERU) and educational personnel in all member countries (See *Eastern Caribbean Education Reform Project: Initiative on curriculum and remediation – Design Mission report, February 1998*).

The initiative in Primary Secondary Science and Technology commenced in 2001, with a meeting of science and technology educators in St. Vincent and the Grenadines. Time was spent initially on defining science and technology, mainly because the primary curriculum concentrated on science only. A working definition has been developed and has been used consistently throughout the development of the programme.

Draft learning outcomes were developed and circulated for comments throughout the curriculum units in the OECS. Subsequent meetings of the working group were held in St. Kitts and Nevis, St. Lucia and Antigua and Barbuda. At each of these meetings teacher educators, teachers and principals formed part of the discussion groups. After the learning outcomes were adopted by the curriculum officers, instructional modules to serve as teachers' guides were planned and developed by members of the working groups. The learning outcomes and modules were all reviewed and edited by the two consultants who worked through all phases of the project.

Time did not permit a formal piloting of the learning outcomes and modules. Since in most cases the same curriculum officer worked on the lower

secondary curriculum also, there is the possibility of the primary curriculum benefiting from the experience gained in the piloting of the lower secondary programme.

The purpose of developing the learning outcomes and instructional modules is to ensure that all children in OECS primary schools attain an acceptable level of knowledge, skills and attitudes associated with science and technology. Each member country retains the right and responsibility for integrating these outcomes into the national primary science and technology curriculum. As usual, teachers will continue to use their initiative and resourcefulness in the implementation of the programme through the use of indigenous resources creating relevance.

The OERU is extremely grateful for the contribution made by all persons and institutions that have been involved in this developmental exercise. First, OERU expresses thanks to the Canadian International Development Agency (CIDA) for the high level of interest shown and the funding provided for the Eastern Caribbean Education Reform Project (ECERP). The Ministries and Departments of Education have contributed resource personnel, accommodation, refreshment, ground transportation, and some materials for workshops. Most important, however, have been the high level of cooperation and commitment to the reform effort displayed by both the administrative and professional sections of Ministries of Education.

The following science education professionals have made significant contribution over the four-year period.

Country	Participant	Designation
Anguilla	Mr. Worrell Brooks	Education Officer, Science
	Mrs. Maria Webster	Secondary School Teacher
Antigua and Barbuda	Mr. Earl Skerritt	Science Coordinator
	Ms. Kendra Thomas	Primary School Teacher
	Ms. Celia Frederick	Secondary school teacher
	Ms. Gracelyn Ireland	Primary school teacher
British Virgin Islands	Ms. Beverlie Brathwaite	Education Officer, Science
Dominica	Mr. Frank Newton	Education Officer Science
	Mr. Gerald Corbette	Lecturer, Dominica State College
Grenada	Mr. Jervis Viechweg	Curriculum Officer, Science
	Ms. Janis Henry	Lecturer, T. A. Marryshow Com. College
Montserrat	Mr. Gregory Julius	Primary school Principal
St. Kitts	Mr. Hilton Clarke	Curriculum

And Nevis	Dr. Lincoln Carty	Officer, Science Former Curriculum Officer, Science
St. Lucia	Mr. Winston Blanchard	Curriculum Officer, Science
	Ms. Imelda Polius	Former Primary School Teacher
St. Vincent and the Grenadines	Mrs. Arlette Keane-Browne	Former Curriculum Officer, Science
	Mrs. Amaala Muhammad	Curriculum Officer, Science
	Mr. Kenroy Johnson	Principal, Secondary School

The OERU also expresses gratitude to the dozens of teachers, principals and students who have participated in discussions and consultations.

The actual planning and subsequent developmental process for the learning outcomes and Teacher's Guide became the responsibility of Dr. Cheryl Remy, former Senior Lecturer at Sir Arthur Lewis Community College, St. Lucia and Professor Winston King, Senior Lecturer, School of Education, UWI, to whom the OERU is very grateful. As a team, Dr. Remy and Professor King have encouraged workshop participants and module writers to think and to create ideas as the work progressed.

The staff at OERU together contributed in no small measure to these modules. Ms. Deborah Alphonse, Accounts/Administrative Assistant, Ms. Natasha Deterville, now Secretary to the Director of Economic Affairs in the OECS, and Ms. Cleotha Randolph, Documentation Officer, worked tirelessly

arranging workshops and reproducing materials. Ms. Natalie Compton of Nagio Creations competently designed the layout of the modules and learning outcomes for printing and electronic reproduction.

Dr. Henry Hinds, Formerly Curriculum Specialist at OERU, was responsible for the curriculum project. Mrs. Lorna Callender and Ms. Candia Alleyne, both former Heads of OERU, have supported the project organizationally and morally. Mr. Johnson Cenac, ECERP Officer, made significant contributions in various ways and at various times throughout the development of this work.

The Primary Science and Technology modules provide an excellent example of the fusion of talent, creativity, rigorous science and technology and cooperation to develop a valuable resource for teachers.

The OERU hopes that principals and teachers will continue to play their roles in making the outcomes and modules come to life in classrooms throughout the OECS. The commitment and effort surely will contribute to the enhancement of knowledge, and skills and the development of positive attitude towards science and technology.

Henry Hinds, Head, OERU

August, 2006

Solar System

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RATIONALE

Earth along with the other eight planets, the moon, and the sun make up the Solar System. It is fascinating and exciting to learn about our neighbours in the Solar System. These modules will help students to understand the Solar Systems and to explain occurrences that they are likely to take for granted. Students also have an opportunity to appreciate how people tend to find ways to solve problems they encounter. Students will see for example that people have developed artificial lighting to cope with darkness – a natural occurrence.

INTRODUCTION

The modules are so structured as to enable teachers to enhance the learning process in the classroom. They provide pupils with the opportunity to engage in hands-on activities involving the use of scientific process skills and attitudes while developing inquiry and problem-solving techniques. Pupils will be made aware of the role of technology in our world and its effect on our lives. The modules provide pupils with opportunities to develop their inventiveness and creativity through a number of well-structured activities.

It is hoped that the modules, being so structured, will enable the goals and objectives to be attained by the teachers and students in schools in O.E.C.S. countries.

THE EXPERIENCES IN THESE MODULES WILL HELP THE STUDENTS TO DEVELOP THE FOLLOWING MAJOR IDEAS:

THE SOLAR SYSTEM

- *Earth is a planet in space.*
- *Earth is part of the solar system which includes the sun, planets and their satellites.*
- *Sun is a star.*
- *Earth rotates and this movement can be used to explain day and night*

TECHNOLOGY

- Technological methods involve the use of problem solving, technological processes and resources to find solutions to people's wants and needs.
- Technology is a human activity.
- Individuals can take part in Technological activity.
- Technology involves the uses of materials, energy, tools/machines and information.
- Technology processes include Biotechnology, Production Technology and Transportation
- Technology changes over time.
- Technology is neither good nor bad, but the way we use it can have positive or negative effects on our lives.
- The use of technology has side effects.

SCIENCE TECHNOLOGY, SOCIETY AND THE ENVIRONMENT

- Science and Technology affect human life, the society and the environment.
- The impact of Science and Technology can be positive or negative, unplanned or planned, immediate or delayed.
- There should be sustainable use of resources and efforts should be made to minimize ecological disturbances.
- People's values, beliefs and attitudes influence Scientific and Technological activity and use.

MODULE 1

SOLAR SYSTEM

GRADES K - 2

GENERAL OBJECTIVES

The students should be able to:

1. Realize that day and night occur in regular cycles.
2. Realize that humans have developed ways to provide light.
3. Understand that the sun, the planets and the moon are parts of the solar system.
4. Understand that the earth is a planet in the solar system.
5. Become aware of the movement of the earth relative to the sun.

SPECIFIC OBJECTIVES

The students should be able to:

1. Observe and record natural occurrences of day and night.
2. Infer that day and night occur in regular cycles.
3. Distinguish between natural and human-made sources of light.
4. Name the sun, the earth and the moon as parts of the solar system.
5. Observe the position of the sun at different times of the day.
6. Identify the phases of the moon.

**LEVELS OF ATTITUDES, SKILLS & TECHNOLOGY
EXPECTED AT GRADES K - 2**

ATTITUDES:

Students should be encouraged to:

Curiosity:	<ul style="list-style-type: none">✓ Ask questions about objects and events.✓ Find out more about events and objects on their own.
Inventiveness:	<ul style="list-style-type: none">✓ Suggest new ways of doing things.
Respect For Evidence	<ul style="list-style-type: none">✓ Explain their results and conclusions.✓ Listen to other students' results and explanations.
Persistence	<ul style="list-style-type: none">✓ Complete activities.✓ Persist at tasks.
Respect For Living Things	<ul style="list-style-type: none">✓ Show sensitivity to living things.
Cooperation	<ul style="list-style-type: none">✓ Share with others.✓ Work together with others.
Concern For Safety	<ul style="list-style-type: none">✓ Observe safety instructions.

SKILLS:

In developing their skills of inquiry, problem solving and design, the students are expected to:

Observing	<ul style="list-style-type: none"> ✓ Use as many senses as are appropriate and safe to gather information. ✓ Identify differences and similarities between objects and events. ✓ Identify sequence in events.
Measuring	<ul style="list-style-type: none"> ✓ Use simple measuring instruments or models of measuring instruments. At first use comparative terms such as bigger, smaller and later use actual figures.
Manipulating	<ul style="list-style-type: none"> ✓ Set up simple experiments to compare results. ✓ Manipulate simple equipment.
Recording	<ul style="list-style-type: none"> ✓ Use pictures and charts to report results. ✓ Fill out simple tables to report results.
Classifying	<ul style="list-style-type: none"> ✓ Group objects according to one or two criteria.
Communicating	<ul style="list-style-type: none"> ✓ Talk freely about their activities and the ideas they have, with or without making a written record. ✓ Use appropriate vocabulary to describe their observations. ✓ Listen to others' ideas and look at their results. ✓ Report events by using demonstrations, role play, simple drawings, paintings and simple sentences.
Inferring	<ul style="list-style-type: none"> ✓ Notice patterns in simple measurements and events.
Interpreting data	<ul style="list-style-type: none"> ✓ Discuss what they find out in response to questions.
Experimenting	<ul style="list-style-type: none"> ✓ Freely ask a variety of questions and suggest how they might be answered. ✓ Suggest how they could investigate to find out answers to questions.
Predicting	<ul style="list-style-type: none"> ✓ Attempt to make predictions (even if not based on patterns).
Problem Solving	<ul style="list-style-type: none"> ✓ Suggest solutions to simple problems.
Designing	<ul style="list-style-type: none"> ✓ Construct models either by following instructions or by using their own designs. ✓ Select appropriate material to make models and gadgets.

Technological Methods	✓ Given problems, the students will be able to discuss and make simple gadgets.
Nature Of Technology	✓ Realize that people use natural things and also make other things from them. ✓ Realize that they can design and make things which may be different from what others make. ✓ Share information with others. ✓ Realize that safety is important in using tools and making things.
<u>Use Of Technology</u>	✓ Appreciate the use of devices, tools and structures made by humans in the home and community . ✓ Appreciate the advantages of using these products. ✓ Realize that human-made things can pollute the environment

UNIT: SOLAR SYSTEM (GRADE k)

DURATION: 2 Lessons

OBJECTIVES

The students should be able to:

1. Observe that day and night are different.
2. Identify natural sources of light.
3. Identify sources of light made by humans.

PROCESS SKILLS

Observing
Classifying
Communicating
Inferring

ATTITUDE

Curiosity
Respect for inventions
Integrity in observing

MATERIALS

pictures
paper
glue
crayons
sources of light (lamps, bulbs, flashlights etc.)

CONTENT SUMMARY

1. Comparing Day and Night
 - There are differences between day and night .
 - During the day the sun’s rays light up the atmosphere.
 - Most times the night is dark.
 - The moon lights up the night sometimes.

2. Sources of Light

- The sun is the main source of natural light.
- People have developed ways to light up the night.
- In homes there are many lighting systems (such as electric lamps, flashlights, lanterns, candles, etc.).

ACTIVITIES

Solar System

1. *Comparing Day and Night*

- Discuss the differences between day and night; allow students to speak about experiences.
- Classify activities as those taking place in the day and those taking place in the night.
- Compare the day sky and the night sky.

2. *Sources of Light*

- List the importance of the sun and moon in providing light.
- Use a mirror to reflect light from the sun on to the wall of the classroom to demonstrate how the moon reflects light from the sun.
- Provide various types of lighting systems found in the home (bulbs, lamps, flashlights, lanterns, candles, etc.). Discuss where, when and how these devices are used.
- Discuss situations in which these inventions are used. Suggest what life would be like without these devices.

Integration with other subjects

Culture (Social Studies)

Students can guess the type of light sources used by their parents and their grand-parents. They can then find out from their parents and test their hypotheses.

Art - Drawing and making models of the day and night sky.

ASSESSMENT

Comparing Day and Night

- Let students draw pictures of an activity that they can do during the day and during the night.
- Draw pictures of the day sky and the night sky.
- Draw pictures and make models of the sun and moon.

Providing artificial light

- Draw pictures of different objects that can produce light. (e.g. bulb, torch, candle. etc.).

ASSESSMENT CHECKLIST

Solar System

Scoring rubric indicating mastery of concepts, skills and attitudes.

- 1 not at all
- 2 partially
- 3 fully

NAME

CONCEPTS	
Describe differences between day and night .	
Name natural forms of light during the day and during the night .	
List a variety of the different kinds of lights that people have invented.	
PROCESS SKILLS	
Ability to a) observe	
b) communicate	
c) infer	
d) use pictures to report results	
ATTITUDES/GROUP SKILLS	
a) Shows interest and curiosity	
b) Shows critical reflection	
c) Find out more about events and objects on their own	

Unit: solar system (grade 1)

DURATION: 4 Lessons

OBJECTIVES

The students should be able to:

1. Observe and record natural occurrences of the day and night.
2. Infer that day and night occur in regular cycles.
3. Identify the phases of the moon.

PROCESS SKILLS

Observing
Inferring
Observation
Communicating

ATTITUDE

Curiosity
Integrity in recording and

CONTENT SUMMARY

- Day and night occur one after the other in a regular pattern.
- The sun is always seen in the day.
- Sometimes we see the moon in the day.
- Most times we see the moon and stars in the night.
- The stars form patterns in the sky.
- The moon has different shapes from time to time.

STUDENT ACTIVITIES

1. *Observing the sky*
 - Encourage students to observe the sky at different times.
 - Discuss with students the difference between the day sky and the night sky.

- Let students record time (nearest hour) it gets dark or the time they start turning on lights at home every day for a week. Let students discover that changes in daytime and nighttime come at almost the same time every day.
- Let students match hours of the day and night to different activities that they do and occurrences in nature (e.g. the position of the sun) for a few days.

2. *Observing the phases of the moon*

- Let students draw and show the different shapes of the moon that they have noticed.
- Observe the shape of the moon at various times of the month.
- Encourage students to observe the full moon if possible.
- Allow students to do a journal showing the different shapes of the moon.

ASSESSMENT

Communicating

Drawing

- Draw a night sky.
- Draw a day sky.
- Draw at least two or three different shapes of the moon.

Unit: solar system (grade 2)

DURATION: 3 Lessons

OBJECTIVES

Students should be able to:

1. Name the sun, the earth and the moon as parts of the solar system.
2. Infer the position of the sun at different times of the day.
3. Identify the phases of the moon.
4. Identify patterns in the occurrences of day and night.

MATERIALS

Paper, Pencils, Crayons

CONTENT SUMMARY

- The sun appears to be in a different position at various times of the day because the earth rotates.
- Changes to daylight and nighttime come at almost the same time every day.
- The sun, the moon and the planets are parts of the Solar System.
- The moon is visible during the night and sometimes during the day.
- The appearance of the moon seems to change in a regular way.
- The moon gets its light from the sun.
- The sun, the moon and the planets are parts of the Solar System.

ACTIVITIES

- Let students investigate shadows and infer what conditions are needed for shadows to form.
- Let students set up an upright ruler or other suitable object in an area open to the sun on a sunny day and investigate the position of shadows at various times during the day:
 - a) morning
 - b) noon
 - c) afternoon
- Allow students to draw object and shadows.
- Discuss the position of the shadow and infer the position of the sun at different times of the day. Demonstrate that if one student remains still (sun) and another student spins around on one spot (Earth), sometimes the “sun” is on the left, on the right, in front of and behind the “Earth.”
- Observe the position of the sun early on mornings, at noon and at sunset. Integrate with Social Studies to identify cardinal points.
- Let students discuss how the sun affects the moon and the Earth (it gives light); how the moon affects the Earth. Let students say names of other planets they know. Discuss that these are all objects in space which form part of a group of objects named the Solar System.
- Encourage students to find simulations of the solar system using computers.
- Let students record the time of sunrise and sunset from the weather news for an extended period of time. Let students look for patterns. These times can be compared with times in other temperate countries. Let students listen to weather news to get times.

ASSESSMENT

Drawing

Objectives on which questions can be based:

- Given the illustration of an object and a time of day, and the position of the sun, students should be able to draw the shadow, which is most likely to appear.
- Students should be able to illustrate the appearance of the sky at sunrise and sunset.
- Students should be able to illustrate the appearances of the moon.

Questions

Write true or false for each of the following statements.

1. The Sun moves. _____
2. The Earth moves. _____
3. On mornings and evenings the shadows are long. _____
4. Shadows are longer at noon. _____.
5. The moon cannot be seen during the day. _____
6. A full moon looks like a complete circle. _____
7. We can only see part of the moon sometimes. _____
8. The moon has its own light. _____
9. The sun gives the moon light. _____
10. A shadow can be formed without light. _____

ASSESSMENT CHECKLIST

- 1 Not at all
- 2 Partially
- 3 Fair knowledge
- 4 Good knowledge

Name -----

CONCEPT	
Knows about a) sunrise	
b) sunset	
c) length of shadows	
d) appearance of the moon	
PROCESS SKILLS	
Ability to: Communicate	
Infer	
Draw conclusions	
Observe	
ATTITUDE	
Curiosity	

MODULE 2

SOLAR SYSTEM

GRADES 3 - 4

GENERAL OBJECTIVES

The students should be able to:

1. Understand the relationship among the sun, the Earth and the moon.
2. Recognize the planets in the solar system.

SPECIFIC OBJECTIVES

The students should be able to:

1. Discuss the relationship among the Earth, moon and sun.
2. Operationally define "rotate."
3. Operationally define "revolve."
4. Operationally define a planet, star and satellite.
5. Identify Earth as a planet in space.
6. Identify the moon as the satellite of the Earth.
7. Identify the sun as a star.
8. List the components of the solar system (e.g. sun, planets and natural satellites).
9. Name the planets of the solar system and place them in their relative positions to one other.
10. Infer that the Sun is the main source of light in the solar system.
11. Construct a model of the solar system.

**LEVELS OF ATTITUDES, SKILLS & TECHNOLOGY
EXPECTED AT GRADES 3 - 4**

ATTITUDES:

Students should be encouraged to:

Curiosity:	<ul style="list-style-type: none"> ✓ Ask questions about objects and events. ✓ Find out more about events and objects on their own.
Inventiveness:	<ul style="list-style-type: none"> ✓ Suggest new ways of doing things. ✓ Use equipment in novel ways.
Respect For Evidence	<ul style="list-style-type: none"> ✓ Explain their results and conclusions, using some evidence. ✓ Listen to other students' results and explanations. ✓ Begin to recognize when conclusions do not fit the evidence.
Persistence	<ul style="list-style-type: none"> ✓ Complete activities. ✓ Persist at tasks.
Respect For Living Things	<ul style="list-style-type: none"> ✓ Show sensitivity to living things.
Cooperation	<ul style="list-style-type: none"> ✓ Share with others. ✓ Work together with others. ✓ Accept responsibilities.
Concern For Safety	<ul style="list-style-type: none"> ✓ Observe safety instructions.

SKILLS:	In developing their skills of inquiry, problem solving and design, the students are expected to:
Observing	<ul style="list-style-type: none"> ✓ Use as many senses that are appropriate and safe to gather information. ✓ Identify differences and similarities between objects and events. ✓ Identify sequence in events.
Measuring	<ul style="list-style-type: none"> ✓ Use simple measuring instruments or models of measuring instruments. At first, use comparative terms such as bigger, smaller and later use actual figures.
Manipulating	<ul style="list-style-type: none"> ✓ Set up simple experiments to compare results. ✓ Manipulate simple equipment.
Recording	<ul style="list-style-type: none"> ✓ Use pictures and charts to report results. ✓ Fill out simple tables to report results.
Classifying	<ul style="list-style-type: none"> ✓ Group objects according to several criteria.
Communicating	<ul style="list-style-type: none"> ✓ Talk freely about their activities and the ideas they have, with or without making a written record. ✓ Use appropriate vocabulary to describe their observations. ✓ Listen to others' ideas and look at their results. ✓ Report events by using demonstrations, role play, simple drawings, paintings and paragraphs. ✓ Use bar graphs, pictures, tables and charts to report results. ✓ Use books and other sources to find information.

SKILLS CONT'D

Inferring	<ul style="list-style-type: none"> ✓ Notice patterns and relationships in simple measurements and events.
Interpreting data	<ul style="list-style-type: none"> ✓ Discuss what they find out in response to questions. ✓ Compare their findings with their predictions. ✓ Notice changes when one variable is changed.
Experimenting	<ul style="list-style-type: none"> ✓ Freely ask a variety of questions and suggest how they might be answered. ✓ Suggest how they could investigate to find out answers to questions. ✓ Have some idea of the variable that has to be changed or what different things are to be compared in an investigation. ✓ Suggest equipment, materials and procedure for conducting investigations.
Predicting	<ul style="list-style-type: none"> ✓ Attempt to use evidence in making predictions.
Hypothesizing	<ul style="list-style-type: none"> ✓ Attempt to explain things that are consistent with evidence. ✓ Suggest how something may have happened.
Problem Solving	<ul style="list-style-type: none"> ✓ Suggest solutions to simple problems.
Designing	<ul style="list-style-type: none"> ✓ Construct models either by following instructions or by using their own designs. ✓ Select appropriate material to make models and gadgets. ✓ Formulate problems, do appropriate research, and devise solutions. ✓ Select appropriate material to make models and gadgets. ✓ Evaluate their own designs using simple criteria.

TECHNOLOGY

<p>Technological Methods</p>	<ul style="list-style-type: none"> ✓ Students will be able to formulate problems, do appropriate research and devise solutions (e.g. construct gadgets).
<p>Nature Of Technology</p>	<ul style="list-style-type: none"> ✓ Look at past inventions in their historical context. ✓ Understand that products are replicable. ✓ Understand that others may be working on the same idea. ✓ Realise that <i>they can use scientific knowledge in doing technology</i> and that technology helps to develop reliable scientific information. ✓ Understand the importance of precision and safety in developing new products. ✓ Understand that technology is novel and creative. ✓ Understand that if the people in a country are creative and innovative, their country can progress. ✓ Understand that people use processes involving living things (Biotechnology) and materials (Production Technology) to satisfy their needs.
<p><u>Use Of Technology</u></p>	<ul style="list-style-type: none"> ✓ Appreciate the use of devices, tools and structures made by humans in the home and community. ✓ Appreciate the advantages of using these products. ✓ Realize that human-made things can pollute the environment. ✓ Look at advantages and disadvantages to help them make decisions of what is the best technology that can be used in a particular situation. ✓ Realize that people may abuse and misuse technology. ✓ Understand that technology may have unintended consequences.

Unit: solar system (grade 3)

DURATION: 3 Lessons

SPECIFIC OBJECTIVES:

The students should be able to:

1. Define a planet, star and satellite.
2. Identify Earth as a planet in space.
3. Identify the Sun as a star.
4. Identify the moon as a satellite.
5. Operationally define “revolve.”
6. Operationally define “rotate”.
7. Discuss the relationship between Earth, moon and Sun.
8. Name the planets of the solar system.

PROCESS SKILLS

Discovery

Experimenting

Communicating

Co-operating

TEACHING STRATEGIES

Co-operative Learning

Role play/simulating

CONTENT SUMMARY

- The solar system consists of the sun, the planets and their satellites .
- A **star** may be defined as a massive shining sphere of hot gas. The sun is a star. It is the closest star to Earth.
- A **planet** is a celestial body that is lit by the light of a star, such as the Sun. Each planet spins on its axis (it **rotates**). The planets orbit or revolve about the sun. In the solar system, there are nine known planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto.
- **Satellites** are bodies that orbit a planet. The moon is a satellite of the Earth. (Human-made machines that orbit the Earth or Moon are also called satellites.)

ACTIVITIES

1. The Solar System

Teacher invites students to name all the heavenly bodies in space they know e.g. stars, moon, the Earth, other planets etc. Teacher asks students to recall pictures they may have seen on television. For example of the Earth is a round ball in Space.

Teacher chooses three students to represent the Sun, the Earth and the moon. Teacher gets the “Earth” to move around the sun and the moon to move around the earth. Students describe these motions as “revolving”.

Teacher gets the “Earth” to spin on its axis (rotate) as it revolves.

Definitions of stars, planets and satellites are introduced. Students are asked to categorize the Earth, the sun and the moon.

ASSESSMENT

Sample questions

Multiple choice: Choose the best answer.

1. The moon is a

- A planet
- B satellite
- C star
- D sun

2. The Earth is a

- A moon
- B planet
- B satellite
- C star

Journal writing activity: The Solar System - Create a journal containing information about Earth, the moon and the Sun.

REFERENCES

www.solarviews.com

UNIT: THE SOLAR SYSTEM (GRADE 4)

DURATION: 3 Lessons

OBJECTIVES

The students should be able to:

1. Name the planets of the solar system and place them in their relative position to one another.
2. Construct a model of the solar system.
3. Infer that the moon is a natural satellite to planet Earth.

PROCESS SKILLS

Discovery

Experimenting

Communicating

Co-operating

TEACHING STRATEGIES

Co-operative Learning

Pictorial Demonstration

MATERIALS

Activity #1: Construct a Model of the Solar System

- Pair of scissors
- Cardboard
- Crayons/Markers
- Pencil

- Blanks sheets of paper

Activity #2: Musical Chairs

- Chairs
- Cassette player/CD player
- Cassettes/CD

CONTENT SUMMARY

- The planets are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto. Mercury is the closest planet to the Sun; it takes 88 days for Mercury to orbit the Sun. Pluto is the planet farthest from the Sun; it takes 248 years for Pluto to orbit the Sun.
- The table below shows the position of the planets in relation to the Sun and the time it takes for each to orbit the Sun.

TABLE SHOWING ORBITAL PERIOD FOR THE PLANETS
IN THE SOLAR SYSTEM

Planet	Time to orbit the Sun
Mercury	88 days
Venus	224 days
Earth	365 days
Mars	686 days
Jupiter	4332 days
Saturn	29.5 years
Uranus	84 years
Neptune	164 years
Pluto	248 years



Fig. 1 The Solar System

- The Earth is the 3rd planet from the Sun; it is 150 million kilometers away, the fifth largest and the only planet known to sustain life. It takes 365 $\frac{1}{4}$ days (1 yr.) for the Earth to revolve about the Sun.



Fig. 2 The Earth

- The Sun is located at the centre of the solar system with all the planets revolving about it. The Sun supplies all the light and energy for the Earth and the entire solar system. The Sun is the largest body in the solar system. It is made up of gases.

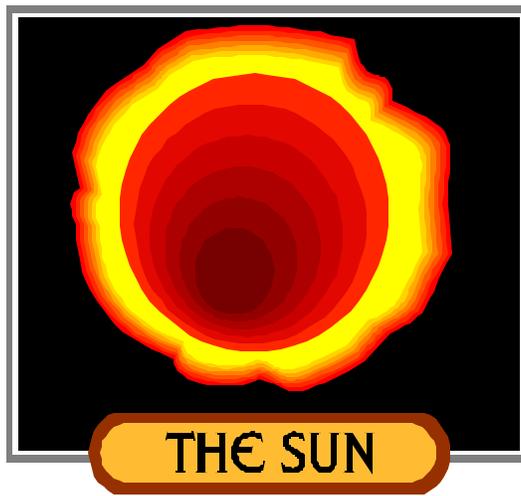


Fig. 3 The Sun

A **planet** is illuminated by light from the Sun.

Satellites are celestial bodies that orbit a planet. The moon is a satellite of the Earth. Human-made machines that orbit the Earth or moon are also called satellites.

ACTIVITIES

Activity #1: Simulation of Solar System

Teacher let students work in groups to form a simulation of the solar system using information about the planets and their position in space relative to one another. Students model how the planets revolve about the sun in different orbits.

Activity #2: Construct a Model of the Solar System

Instructions:

Students will construct a model of the Solar System. The Sun, the planets, and many smaller objects that travel around the sun make up the solar system.

The planets which orbit the sun are: ***Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto.***

Use a drawing as a guide.

Instructions:

1. Cut out ten circular shapes from one sheet of blank paper.
2. Colour one yellow – to represent the Sun- and the others a different colour to represent each of the nine planets.
3. Place another blank sheet of paper on top of cardboard.
4. Position the shapes around the sun as shown in the drawing.

Activity #3: Naming the Planets - Musical Chairs

This activity may be modified using popular music.

Materials: chairs, cassette player/CD player, cassettes/CD

Instructions:

1. Let nine students stand in a circle in front of eight chairs.
2. Each student will represent a planet.
3. The name of each planet will be called out.
4. As the name of a planet is called out, the student representing that planet should move from his/her position and try to get to a vacant chair.

Activity #4: Mnemonics

Create a mnemonic phrase to help students learn the planets in correct order. Use names of students or let them come up with other ideas for the mnemonic to help them to learn the names.

E.g. **M**arcy **V**ega **e**ats **m**ango **j**elly **s**andwiches **u**nder **N**ancy's **p**atio.

Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto

Activity 4. Solar system bookmarks

Cut out strips of paper; punch a small hole at the top of each strip of paper. Thread a few different pieces of coloured string through the hole and tie. Draw/paint/colour pictures of the sun and the planets on each strip.

Activity 5. Looking at Stars

Instructions:

Students should observe stars on a dark night and away from street light/ lamp posts.

They can write down what they see (e.g. brightness of stars, sizes of stars and how many in a particular area).

Safety Precautions

Exercise care with the pair of scissors.

ASSESSMENT

1. The planet that is closest to the sun is

- Earth
- Jupiter
- Mercury
- Pluto

2. The planet farthest from the sun is

- Earth
- Pluto
- Uranus
- Saturn

Teacher should assess students' models of the solar system using selected criteria.

Attitudes can be included as in the following checklist:

CHECKLIST				
Accepts Responsibility				
Shows Self-motivation				
Shares Responsibility				
Shares information				
Takes initiative				
Communicates effectively				
Participates in discussion				
Listens to others				
Respects each others opinion				
Meets deadlines				

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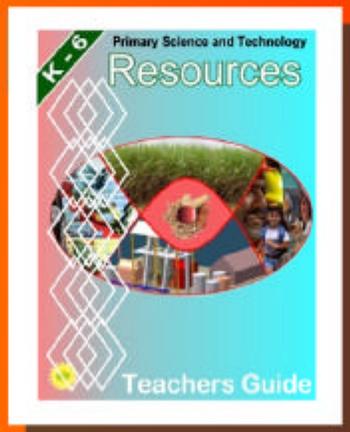
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